

# Safety Data Sheet

# o-Toluidine hydrochloride

Division of Safety  
National Institutes  
of Health



## WARNING!

THIS COMPOUND IS TOXIC AND CARCINOGENIC. IT IS READILY ABSORBED THROUGH THE INTESTINAL TRACT. THE FREE BASE IS ABSORBED THROUGH THE SKIN AND RESPIRATORY TRACT. AVOID FORMATION AND BREATHING OF AEROSOLS.

LABORATORY OPERATIONS SHOULD BE CONDUCTED IN A FUME HOOD, GLOVE BOX, OR VENTILATED CABINET.

AVOID SKIN CONTACT: IF EXPOSED, WASH WITH SOAP AND COLD WATER. AVOID WASHING WITH SOLVENTS. AVOID RUBBING OF SKIN OR INCREASING ITS TEMPERATURE.

FOR EYE EXPOSURE, IRRIGATE IMMEDIATELY WITH LARGE AMOUNTS OF WATER. FOR INGESTION, INDUCE VOMITING. DRINK MILK OR WATER. REFER FOR GASTRIC LAVAGE. FOR INHALATION, REMOVE VICTIM PROMPTLY TO CLEAN AIR. ADMINISTER RESCUE BREATHING IF NECESSARY. REFER TO PHYSICIAN.

IN CASE OF LABORATORY SPILL, WEAR PROTECTIVE CLOTHING DURING CLEANUP. AVOID SKIN CONTACT OR BREATHING OF AEROSOLS. USE WATER TO DISSOLVE COMPOUND. USE ABSORBENT PAPER TO MOP UP SPILL. WASH DOWN AREA WITH SOAP AND WATER. DISPOSE OF WASTE SOLUTIONS AND MATERIALS APPROPRIATELY.

While this data sheet deals mainly with the hydrochloride of ortho-toluidine, this salt shares with the free base such aspects as analysis and biological effects (other than routes of absorption). Since the physical properties of the two are quite different and have a bearing on handling procedures, they are listed separately below; otherwise, unless specific mention is made, the data apply to both forms.

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Prepared by the Environmental  
Control and Research Program

## Background

ortho-Toluidine hydrochloride is a white crystalline, water-soluble solid of moderate toxicity. While data are limited, it appears to have carcinogenic properties. Its major use is as an intermediary in the manufacture of dyes. It has also been used in the clinical laboratory for detection of glucose in blood.

The permissible exposure limit to ortho-toluidine is 9 mg/m<sup>3</sup> as an 8-hour, time-weighted average (ACGIH, 1987).

## Chemical and Physical Data

### ortho-Toluidine

1. Chemical Abstract No.: 95-53-4

2. Synonyms:

2-Toluidine

2-Methylaniline

o-Tolylamine

o-Methylaniline

2-Aminotoluene

1-Amino-2-methylbenzene

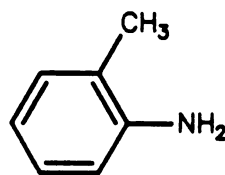
o-Aminotoluene

2-Amino-1-methylbenzene

Benzamine, 2-methyl- (9CI)

3. Molecular  
formula:  
C<sub>7</sub>H<sub>9</sub>N

structure:



weight:  
107.16

4. Density: 1.004 g/cm<sup>3</sup> at 20°C relative to water at 4°C; vapor, 3.69 (air = 1) (Sax, 1979).

5. Absorption spectroscopy: UV (H<sub>2</sub>O, pH 10): λ (log ε) = 232.5 (3.88) and 281.5 (3.16). Infrared, NMR, and mass spectral data have been tabulated (Grasselli and Ritchey, 1975).

6. Volatility: Vapor pressure is 1 mm Hg at 44°C. (For values at higher temperatures, see Weast, 1979, p. D-209.)

7. Solubility: Slightly soluble in water; miscible with ethanol, ether, and carbon tetrachloride.

8. Description: Slightly yellow liquid.

Boiling point: 200.2°C; 80.14°C at 10 mm Hg.

Melting point: -14.7°C for the (stable)  $\beta$ -form.

Stability: The pure material turns reddish-brown on prolonged exposure to air and light.

Chemical reactivity: ortho-Toluidine exhibits the usual reactivity of primary aromatic amines (salt formation, acylation, alkylation, isocyanide formation, diazotization, oxidation by neutral and basic permanganate) and of aromatic compounds in general (ring substitution).

Flash point: 85°C (closed cup).

Autoignition temperature: 482°C.

Explosive limits in air: No data.

#### ortho-Toluidine hydrochloride

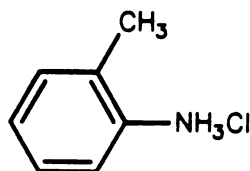
Chemical Abstract No.: 636-21-5

Synonyms: See section on ortho-toluidine; add "hydrochloride" to each synonym.

Molecular  
formula:  
 $C_7H_9N \cdot HCl$

weight:  
143.6

structure:



Density: No data.

Absorption spectroscopy: UV (methanol):  $\lambda$  = 284, 266, and 258.  
Infrared and NMR spectral data have been tabulated (Grasselli and Ritchey, 1975).

Volatility: No data; may be considered to be low.

Solubility: Very soluble in water; soluble in ethanol; insoluble in ether and benzene.

Description: White monoclinic prisms.

Boiling point: 242.2°C.

Melting point: 215°C.

10. Stability: No data; probably quite stable in the absence of moisture and alkali.
11. Chemical reactivity: On alkalization, exhibits the chemical reactivity of the free base (see section on ortho-toluidine).
12. Flash point: No data.
13. Autoignition temperature: No data.
14. Explosive limits in air: No data.

#### Fire, Explosion, and Reactivity Hazard Data

1. Use foam, carbon dioxide, or dry chemical fire extinguishers. ortho-Toluidine hydrochloride does not present unusual fire and explosion hazards.
2. No conditions contributing to instability have been reported for ortho-toluidine hydrochloride. However, the free base is somewhat flammable; therefore, alkaline conditions should be avoided in fire fighting.
3. No incompatibilities other than oxidants under alkaline conditions are known.
4. ortho-Toluidine emits toxic fumes when heated. It is not known whether this also applies to the hydrochloride.
5. ortho-Toluidine hydrochloride does not require nonspark equipment.

#### Operational Procedures

The NIH Guidelines for the Laboratory Use of Chemical Carcinogens describe operational practices to be followed when potentially carcinogenic chemicals are used in NIH laboratories. The NIH Guidelines should be consulted to identify the proper use conditions required and specific controls to be implemented during normal and complex operations or manipulations involving ortho-toluidine hydrochloride.

It should be emphasized that this data sheet and the NIH Guidelines are intended as starting points for the implementation of good laboratory practices when using this compound. The practices and procedures described in the following sections pertain to the National Institutes of Health and may not be universally applicable to other institutions. Administrators and/or researchers at other institutions should modify the following items as needed to reflect their individual management system and current occupational and environmental regulations.

1. Chemical inactivation: No validated method reported.

2. Decontamination: Turn off equipment that could be affected by ortho-toluidine hydrochloride or the materials used for cleanup. If there is any uncertainty regarding the procedures to be followed for decontamination, call the NIH Fire Department (dial 116) for assistance. Use absorbent paper to mop up spill. Wipe off surfaces with water, then wash with copious quantities of water. Glassware should be rinsed in a hood with soap and water. Animal cages should be washed with water.
3. Disposal: No waste streams containing ortho-toluidine hydrochloride shall be disposed of in sinks or general refuse. Surplus ortho-toluidine hydrochloride or chemical waste streams contaminated with ortho-toluidine hydrochloride shall be handled as hazardous chemical waste and disposed of in accordance with the NIH chemical waste disposal system. Nonchemical waste (e.g., animal carcasses and bedding) containing ortho-toluidine hydrochloride shall be handled and packaged for incineration in accordance with the NIH medical-pathological waste disposal system. Potentially infectious waste (e.g., tissue cultures) containing ortho-toluidine hydrochloride shall be disinfected by heat using a standard autoclave treatment and packaged for incineration, as above. Burnable waste (e.g., absorbent bench top liners) minimally contaminated with ortho-toluidine hydrochloride shall be handled as potentially infectious waste and packaged for incineration, as above. Absorbent materials (e.g., associated with spill cleanup) grossly contaminated shall be handled in accordance with the chemical waste disposal system. Radioactive waste containing ortho-toluidine hydrochloride shall be handled in accordance with the NIH radioactive waste disposal system.
4. Storage: Store solid ortho-toluidine hydrochloride and its solutions in dark-colored, tightly closed containers, preferably under refrigeration. Avoid exposure to light and moisture. Store working quantities of ortho-toluidine hydrochloride and its solutions in an explosion-safe refrigerator in the work area.

#### Monitoring and Measurement Procedures Including Direct Field Measurements and Sampling for Subsequent Laboratory Analysis

1. Sampling: Procedures have been described only for air sampling of the free base; these involve adsorption in silica gel tubes (Wood and Anderson, 1975). Techniques for sampling metal, painted, and concrete surfaces for tests of degree of contamination and decontamination have been described for aromatic amines in general and are probably applicable to ortho-toluidine (Weeks et al., 1976).
2. Analysis: Colorimetric methods, based either on diazotization and coupling (El-Dib, 1971) or oxidation in the presence of

4-amino antipyrine (El-Dib et al., 1975), with sensitivities of 0.1 mg/l have been described. These methods are general ones for aromatic amines and therefore not specific. Gas chromatography has been used in conjunction with sampling of the free base (Wood and Anderson, 1975). No procedures for analysis of biological samples have been described.

## Biological Effects (Animal and Human)

**Absorption:** ortho-Toluidine hydrochloride is absorbed by ingestion and parenteral injection. The free base is also absorbed by inhalation and through the skin but there are no data indicating whether this applies to the hydrochloride.

**Distribution:** No data.

**Metabolism and excretion:** Orally (Cheever et al., 1980) and subcutaneously (Son et al., 1980) administered  $^{14}\text{C}$ -labeled ortho-toluidine in rats indicates that the urine is the main route of excretion, predominantly in the form of metabolites. These are chiefly products of N-acetylation and hydroxylation at the 4-position. Minor paths include hydroxylation at the 6-position and oxidation of the methyl and amino groups. Conjugates of these oxidation products were mainly sulfates and glucuronides.

**Toxic effects:** The acute LD50 of ortho-toluidine hydrochloride has been reported as 2,950 (rat, oral), 150 (rat, intraperitoneal), and 113 mg/kg (mouse, intraperitoneal). Very little has been published on specific toxic effects except for transitory methemoglobinemia in cats, dogs, and rats (McLean et al., 1967; Jacobson, 1972).

**Carcinogenic effects:** In an extensive recent study, ortho-toluidine hydrochloride was incorporated in the diet at levels of 3,000 or 6,000 ppm for rats and 1,000 or 3,000 ppm for mice, over a period of 101-104 weeks. This resulted in sarcomas of the spleen and other organs in both species, carcinomas of the bladder and scrotal mesotheliomas in male rats, fibroadenomas and adenomas of the mammary glands in female rats, hemangiosarcomas at various sites in male mice, and hepatocellular carcinomas in female mice (Anon., 1978). This is in line with earlier investigations showing carcinogenic effects in rats on the bladder (Ekman and Strombeck, 1949) and Zimbal glands (Pliss and Vol'fson, 1972).

**Mutagenic and teratogenic effects:** All available information shows lack of mutagenicity of ortho-toluidine hydrochloride in Salmonella, with or without activating systems. There is no information on teratogenicity.

## Emergency Treatment

1. Skin and eye exposure: For skin exposure, remove contaminated clothing and wash skin with soap and water. Skin should not be rinsed with organic solvents. Avoid rubbing of skin or increasing its temperature. For eye exposure, irrigate immediately with copious quantities of running water for at least 15 minutes. Obtain ophthalmological evaluation.
2. Ingestion: Drink plenty of water or milk. Induce vomiting. Refer for gastric lavage.
3. Inhalation: Remove victim promptly to clean air. Administer rescue breathing if necessary.
4. Refer to physician.

## References

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